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FINAL REPORT

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POTENTIAL USES FOR CARAWAY MEAL

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Research Report

Potential Uses for Caraway Meal

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Acknowledgement

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1. Summary

Caraway meal is a by-product of extracting essential oil from caraway seed. Tests were done to determine its suitability for use as a greenhouse growing medium, pet litter, or animal feed. The caraway meal was found to be not suitable for use as greenhouse growing medium, pet litter, or for hog feed. However, if used as a concentrate and mixed to a maximum of 50/50 with other concentrates (such as canola meal), caraway meal can be used as a protein source for beef cattle.

2. Technical Report

2.1 Introduction

PAMI was previously involved in a project to extract essential oil from caraway seed. Because the spent caraway meal had been exposed to steam for 3 to 4 hours, which may serve to sterilize any seeds in the material, and was largely intact as organic matter, it was thought that it might have further uses. This project was done to attempt to identify a potential use for caraway meal.

2.2 Objectives

The objectives of this project were to:

1. Investigate the suitability of caraway meal as a greenhouse growing medium.
2. Investigate the suitability of caraway meal as pet litter.
3. Determine if caraway meal can be used as animal feed or an animal feed supplement.

2.3 General Description

The greenhouse growing medium tests were done using supplies provided by a local greenhouse. Included were plug trays, regular trays, seeds, established plugs and standard growing and starter medium. All tests were done indoors at PAMI and a grow light was used, as well as other procedures as suggested by greenhouse personnel.

The pet litter trials were done at the local veterinary clinic. The caraway meal was placed in a standard cat litter box and its suitability assessed.

The animal feed tests included nutrient composition tests, and both preference and palatability trials. Tests were done by the Prairie Feed Resource Centre of the University of Saskatchewan.

2.4 Scope of Test

Greenhouse Trials

Greenhouse growing medium tests were done with both starter and grower medium. In all cases, pure caraway meal was compared to standard growing medium and a 50/50 mix of the two.

Petunias were used to test the starter medium. Thirty-six seeds were placed in each of the three mixtures, which were wetted and covered with a plastic dome, and placed under the grow light, in a manner as instructed by the local greenhouse personnel.

Petunia seedlings, and tomato and cabbage seeds were used to test the use of caraway meal as a grower medium. Twelve petunia seedlings were placed in each mixture. Thirty tomato and cabbage seeds were also placed in each mixture. All were watered and placed under the grow light as instructed by the local greenhouse personnel. Subsequent watering and any other treatments were also done as instructed.

Pet Litter Trials

The pet litter trials consisted of filling a cat litter box with caraway meal and noting the cat's behaviour and response to the caraway meal. A checklist and test guide was prepared by PAMI for the veterinary personnel, and they carried out data collection.

Cattle Feed Trials

Samples were analysed for nutrient composition to fit modelling within the Cornell net carbohydrate and protein system. Further, digestibility data was collected on the caraway meal from tests with swine. Preference and acceptability trials with Holstein heifers were conducted.

Eight Holstein heifers averaging 351 kg were selected for the feeding trials. Heifers were randomly placed in individual pens that were approximately 3 x 5 m and bedded with straw. There were individual waterers for each heifer. Heifers were fed in a conventional wooden feed bunk.

The experimental diets were as follows:

Trial 1 Preference and palatability alone

- Caraway meal at 1.04 kg/day on an as fed basis (test diet).
- Canola meal at 1.04 kg/day on an as fed basis (control diet).

Alfalfa hay was fed *ad libitum*. Concentrate at 1.00 kg/day on an as fed basis was fed after the morning and afternoon testing.

Trial 2 Preference and palatability mixed with concentrate

- Caraway meal at 1.04 kg/d on an as fed basis mixed with 1.00 kg/d concentrate on an as fed basis (test diet).
- Canola meal at 1.04 kg/d on an as fed basis mixed with 1.00 kg/d concentrate on as fed basis (control diet).

Alfalfa hay was fed *ad libitum*.

- Each heifer had two tubs for choice, one tub for caraway meal and one tub for canola meal.
- One tub is placed in the manger for 5 minutes, then the tub is removed and the next tub is placed in the manger for 5 minutes.
- Each product is tested for a total of 5 minutes in the morning and 5 minutes in the afternoon.
- Both products were alternated from day to day (e.g. Day 1 – Caraway meal then Canola meal; Day 2 – Canola meal then Caraway meal) to avoid bias behaviour.

Experimental Schedule

- 4 day adaptation period
- 7 day preference and palatability period

Each trial received 7 days of testing.

2.5 Results and Discussion

Greenhouse Trials

Six days after planting, it was evident that the caraway meal was not adequate as a greenhouse growing medium. At this time, 24 petunias had germinated in the starter medium light in the 50/50 mix, and none in the caraway meal. Even after 11 days, no petunias had germinated in the caraway meal. There was also some mould growth on the surface of the caraway meal and 50/50 mix plugs.

Similar observations were made in the grower medium. Six days after seeding, 18 tomatoes and 16 cabbages had germinated in the grower mix, and the petunias looked healthy. In the 50/50 mix, 24 tomatoes and 17 cabbages had germinated, but they did not look as green and healthy as the grower mix. The petunias in the 50/50 mix also were yellowed, compared to those in the grower mix. At this time, the petunias in the caraway meal were alive but had a beige fringe on the lower leaves, and no other

seeds had germinated. There was also a lot of brown water draining from the caraway meal that had a foul odour. After eleven days, the trend was the same, as no seeds had germinated in the caraway meal, and the plants in the 50/50 mix were dead or dying.

Pet Litter Trials

The caraway meal was not suitable as a pet litter, as the test cat did not use the caraway meal, and, in fact, urinated on some clothing in the room instead. The test was discontinued after eleven days, at which time the cat had not yet used the caraway meal in the litter box.

Cattle Feed Trials

The analysed nutrient composition of caraway meal is given in **Table 1.**

Table 1. Nutrient Composition Caraway Meal (dry matter basis).

Nutrient	Caraway Meal A	Caraway Meal B
Moisture %	9.308	9.153
Ash %	5.84	5.94
E.E. (Ether Extract) %	0.82	0.88
Crude Protein (N x 6.25)%	21.66	21.40
Acid Detergent Fibre %	26.50	22.42
Neutral Detergent Fibre %	57.64	59.29
NpN (% SCP) %	95.72	99.89
Acid Detergent lignin %	0.67	0.71
SCP (% CP) %	10.31	10.03
ADICP %	1.88	1.90
Starch %	0.00	0.00
NDICP %		
TDN (Calculated Dairy NRC) %	64.19	65.63

From the nutrient composition the caraway meal is reasonably high in protein and just slightly less than field peas. The protein is 90% true protein with almost all of the soluble crude protein being non-protein nitrogen. This level of non-protein nitrogen is not unusual, although above average.

The fibre content (ADF and NDF) is high in the feed. The lignin content is low, indicating that, while having a high fibre content, the fibre should be fairly digestible for ruminants. The calculated energy content (TDN) for ruminants is given in **Table 1.** This energy content would be similar to good quality corn silage or very good quality barley silage.

This nutrient composition places the caraway meal as a relatively good source of protein but only medium in energy density.

In the first preference and palatability trial (caraway or canola meal alone), there was a significant difference between the two test products. The heifers preferred canola meal (835 g/d) to caraway meal (565 g/d). It was observed that a few of the heifers would cough after consuming the caraway meal. One of the heifers refused to consume the caraway meal, as it was observed that this heifer would sniff the caraway meal and walk away. However, the other heifers on trial did not exhibit this behavioural pattern. When the two test products were visually evaluated during handling, the caraway meal was notably coarser and contained short pieces that were very sharp. Perhaps these features may have deterred some of the heifers from eating the caraway meal.

In trial two, concentrate was added to the two test products, and the results showed that there was no significant difference between the caraway (1,602 g/d) and canola meal (1,687 g/d). When mixed with an equal amount of concentrate, minimal sorting of concentrate was observed at the beginning of the trial. However, the sorting of concentrate appeared to diminish as the trial continued. Trial two showed that when caraway is mixed with concentrate, heifers would consume it to the same extent as canola meal mixed with concentrate.

There was opportunity to conduct swine digestibilities. The digestibility coefficients were, dry matter = 41.46%, energy = 33.39% and protein = 34.07%. With these digestibilities clearly caraway meal is not an utilizable feed source for animals, such as swine, that cannot ferment or use the fibre.

The only value of caraway meal determined would be as a protein source in cattle diets. Because of milk taint problems it should not be used in dairy cow diets. The greatest suitability and value would be in beef cattle at levels up to 50% of total concentrate, when the concentrate and caraway mix is less than 25% of total feed intake. For higher levels of concentrate use, 20% of the total concentrate mix as caraway meal may be maximal.

The value of caraway meal in comparison to canola meal would vary from 50% to 55% of canola meal value on a protein and energy basis. The use would be as a protein source.

4. Equipment

No equipment was purchased for this project.

5. Project Developed Materials

No materials were produced during this project.

6. Project Photos

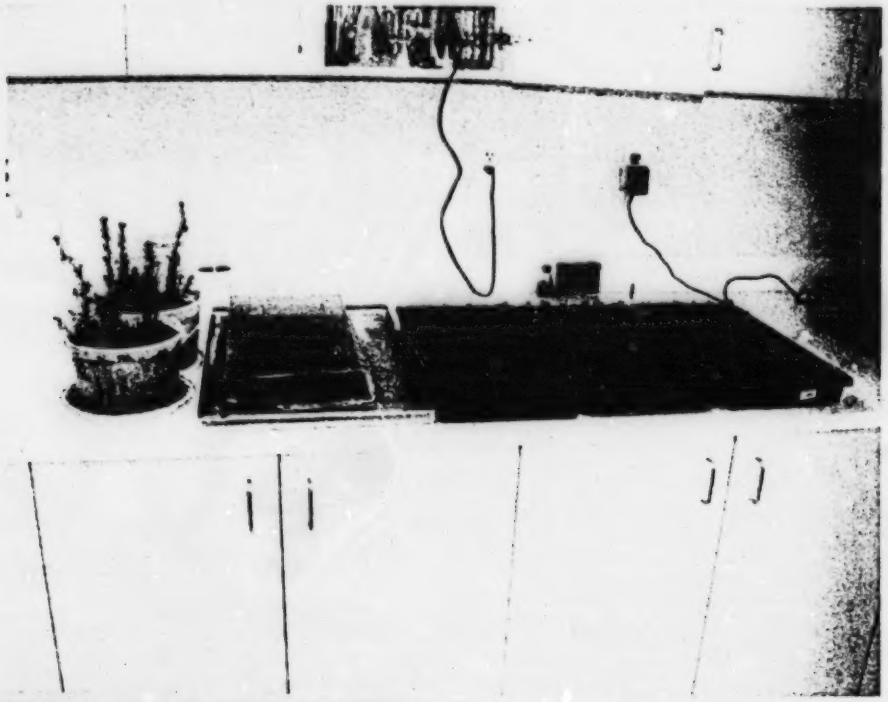

Figure 1. Initial Greenhouse Trial Set-up.

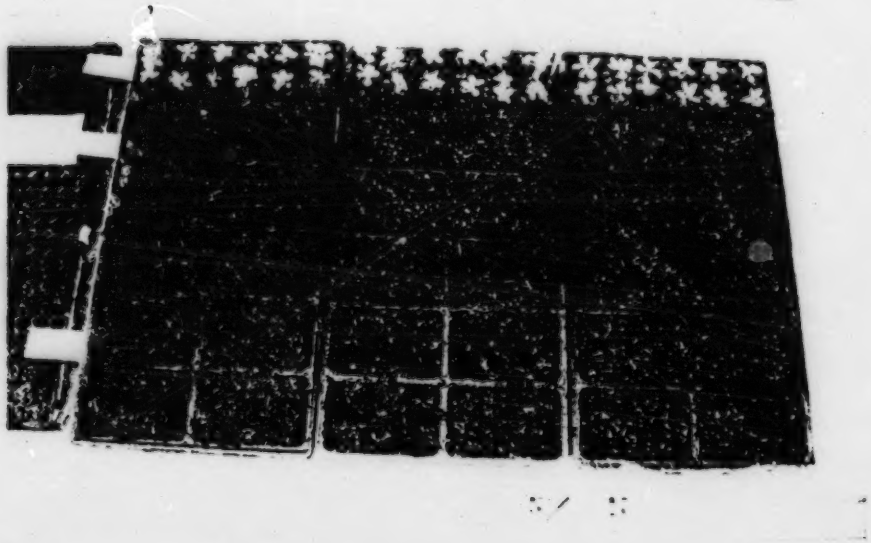

Figure 2. Grower Medium Plants at Start.

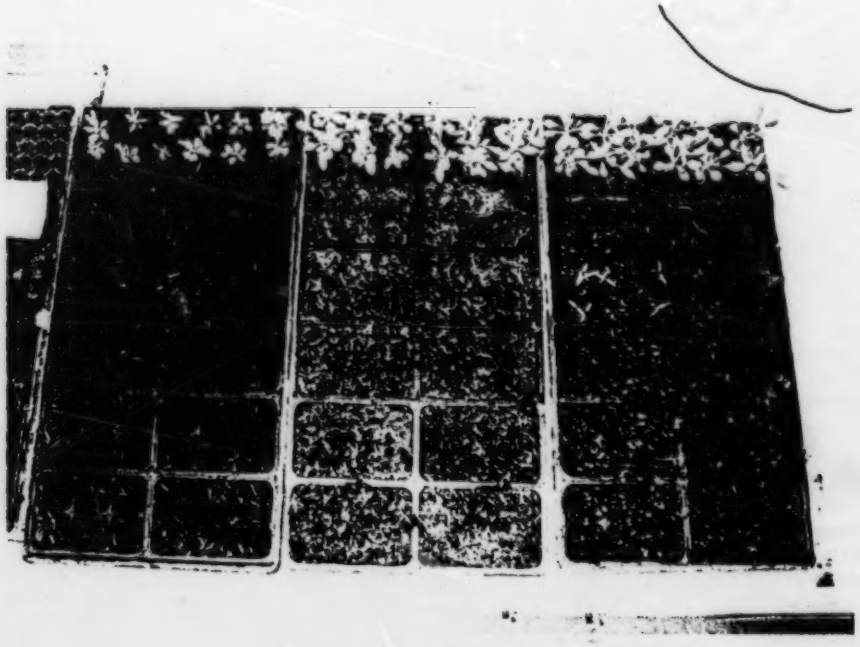

Figure 3. Grower Medium Plants After 7 Days.

7. Acknowledgements

ADF will be acknowledged in any releases of information from this project. PAMI will also forward this report to the Saskatchewan Herb and Spice Association.

8. Expense Statement

	Budget	Actual	Variance
Salaries	2,713.00	3,470.50	757.50
Travel	517.00	206.69	-310.31
Material and Supplies		30.00	30.00
Other	11,770.00	6,800.00	-4,970.00
Total	**15,000.00**	**10,507.19**	**-4,492.81**

Salaries are slightly higher than budgeted, as PAMI personnel did the greenhouse trials instead of the local greenhouse. "Other" costs were lower than budgeted because of the above, and because some of the budget was actually allocated to the forestry portion of the original proposal that was removed from the project before the contract was signed.